

Translation

PATENT COOPERATION TREATY
PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference NTK04-1629WO | FOR FURTHER ACTION See Form PCT/IPEA/416 | |
| International application No. PCT/JP2004/011334 | International filing date (day/month/year) 06.08.2004 | Priority date (day/month/year) 07.08.2003 |
| International Patent Classification (IPC) or national classification and IPC C07D215/30, C09K11/06, H05B33/14 // C07C37/64, 39/14 | | |
| Applicant NIPPON STEEL CHEMICAL CO., LTD. | | |

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| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>4</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> |

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| Date of submission of the demand | Date of completion of this report |
| Name and mailing address of the IPEA/JP | Authorized officer |
| Facsimile No. | Telephone No. |

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International application No.
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Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

international search (Rule 12.3 and 23.1(b))
 publication of the international application (Rule 12.4)
 international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

the international application as originally filed/furnished
 the description:
 pages 1-50 as originally filed/furnished
 pages* _____ received by this Authority on _____
 pages* _____ received by this Authority on _____

the claims:
 nos. 4, 6-9 as originally filed/furnished
 nos.* _____ as amended (together with any statement) under Article 19
 nos.* 1-3, 5 received by this Authority on 22.06.2005
 nos.* _____ received by this Authority on _____

the drawings:
 sheets fig. 1 as originally filed/furnished
 sheets* _____ received by this Authority on _____
 sheets* _____ received by this Authority on _____

a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. The amendments have resulted in the cancellation of:

the description, pages _____
 the claims, nos. _____
 the drawings, sheets/figs _____
 the sequence listing (specify): _____
 any table(s) related to sequence listing (specify): _____

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages _____
 the claims, nos. _____
 the drawings, sheets/figs _____
 the sequence listing (specify): _____
 any table(s) related to sequence listing (specify): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|-------------------------------|--------|-----|-----|
| Novelty (N) | Claims | 1-9 | YES |
| | Claims | | NO |
| Inventive step (IS) | Claims | | YES |
| | Claims | 1-9 | NO |
| Industrial applicability (IA) | Claims | 1-9 | YES |
| | Claims | | NO |

2. Citations and explanations (Rule 70.7)

Citations

Document 1: JP 05-214332 A (Eastman Kodak Co.), 24 August 1993

Document 2: JP 05-198378 A (Eastman Kodak Co.), 06 August 1993

Document 3: JP 06-172751 A (Eastman Kodak Co.), 21 June 1994

Document 4: JP 2003-142264 A (Pioneer Electronic Corp.), 16 May 2003

Explanations

Claims 1 to 9

The inventions set forth in claims 1 to 9 are not disclosed in any of the documents that are cited in the international search report; therefore, said inventions are novel. However, the inventions in question do not involve an inventive step in the light of documents 1 to 4 cited in the international search report.

Documents 1 to 3 disclose aluminum complexes represented by general formula (1) set forth in claim 1 wherein O-Ar₁-Ar₂ is a phenolate ligand, and indicate

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that the aluminum complexes in question are light emitting materials for use in organic EL devices. Therein, documents 1 to 3 further indicate that it is preferable for said phenolate ligands to be derived from various phenols that include a hydroxynaphthalene, and for said phenolate ligands to have a total of 7 to 18 carbon atoms (for example, refer to document 1, paragraph [0019]); indicate that it is acceptable for aromatic hydrocarbon groups such as phenyl rings or naphthyl rings to be substituted in as substituent groups, and that the phenyl substituent groups and the like have been observed to produce highly desirable organic EL device characteristics (for example, refer to document 1, paragraph [0021]); and disclose a sublimated powder of an aluminum complex wherein the abovementioned phenolate ligand is an o-, m- or p- phenylphenolate, said sublimated powder having been refined by means of sublimation.

Meanwhile, document 4 discloses an organic EL element in which a light emitting layer that comprises an organic host material (e.g. an aluminum complex or the like) and a phosphorescent organic guest material is disposed between the anode and the cathode. Therein, document 4 presents 2, 3, 7, 8, 12, 13, 17, 18-octaethyl-21H, 23H-porphine platinum (II) and tris (2-phenylpyridine) iridium, etc., as examples of the phosphorescent organic guest material, and further presents an organic EL element with a light emitting layer wherein the ((1, 1'-biphenyl)-4-olato) bis(2-methyl-8-quinolinolate) aluminum that serves as the organic host material and the 2, 3, 7, 8, 12, 13, 17, 18-octaethyl-21H, 23H-porphine platinum (II) or other such

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red phosphorescent material that serves as the organic material are co-evaporated from different evaporation sources (examples 1 to 3).

Consequently, it would have been easy for a person skilled in the art to conceive of employing various phenolate ligands, including phenyl group-substituted naphthlates, as the phenolate ligands in the aluminum complexes that are disclosed in documents 1 to 3, and delimiting an upper limit for the content of impurities and eliminating the impurities via the application of a well-known refinement method such as recrystallization in order to improve the device characteristics and the stability of the complexes in question. In addition, it would also have been easy for a person skilled in the art to conceive of employing an aluminum complex that has been obtained in such a manner as the organic host material in the organic EL element that is disclosed in document 4, as appropriate.

Furthermore, an investigation of the disclosures in the description of the present application revealed that the present application does not include comparisons between complexes that comprise the phenolate ligands that are set forth in claim 1 and complexes that comprise the o-, m-, or p- phenylphenolate ligands or the other phenolate ligands that are specifically disclosed in documents 1 to 3, and thus the inventions that are set forth in claims 1 to 9 cannot be considered to exhibit a significant effect that could not have been predicted in the light of the inventions disclosed in documents 1 to 4.

Moreover, in the pertinent technical fields it is well known that impurities which comprise compounds with

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halogen atoms will cause a reduction in the photoluminance and the light emission lifetime of the organic EL element due to the fact that the compound with a halogen atom acts as a trap for the electron holes or the electrons that are transported from each electrode (if necessary, refer to the document WO 2000/41443 A1, page 40, lines 1 to 10).